

Suncor's cost-effective, manageable predictive maintenance program

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The phrase, "less is more," sums up our experience at Suncor since we began automating the collection and reduction of vibration data as part of a predictive maintenance program on general purpose rotating machinery.

Since we began employing automated data collection and reduction, the time spent collecting and reducing data has been reduced by 70 percent. And the cost-effectiveness and reliability of our predictive maintenance program has increased tenfold.

Suncor operates an oil mine and a refinery that processes the mined oil into synthetic crude oil in Alberta, Canada. Preventing interruptions in production in this complex is extremely important. One hour of lost production can mean a loss of 65,000 barrels of crude oil, which at current market rates translates into more than half a million dollars.

More than 4,800 pieces of machinery, from 5 hp to 50,000 hp, are now included in Suncor's predictive maintenance program. The machinery monitored includes gearboxes, pumps, turbine compressors, fans and rollers, fin fans, mixers, mine equipment, and earth moving equipment. Each earth moving machine contains a 35-foot bearing.

When we started the program in late 1984, our goals were to increase cost-effectiveness and manageability. Under the former program, we averaged 14 fail-

ures per week because there were just not enough hours in the day to analyze data.

With our present predictive maintenance program, we are averaging one machine failure per week. Seventy-five percent of the work we did manually is now automated, reducing the time spent collecting data from 510 hours to 112 hours per week.



Using instruments such as the Snapshot for automated data collection and reduction has made Suncor's predictive maintenance program more effective.

Manual maintenance program: Time-consuming and ineffective

Under our previous maintenance program, it took approximately one month for 16 millwrights, working 40 hours a week on three shifts, to collect vibration data on all critical machinery in the predictive maintenance program.

Vibration meters were used to collect vibration data, which was then recorded by the millwrights on a data sheet. No two readings were ever the same. Building a trend was a lengthy and sometimes impossible process, made more difficult by the manual analysis of the vibration data.

The former program did not prove effective for anticipating potential machine failures. If the vibration levels on a machine increased the week after the last reading, there was a high probability of it failing before the next reading was taken, usually three to four weeks later.

To make our predictive maintenance program work, we needed an automated system that collected overall and dynamic vibration data and provided alarm lists, trending, and automatic reduction of vibration data.

Automated data collection and reduction: Cost-effective and efficient

Automating our collection and reduction of vibration data was the most cost-effective and efficient way to conduct our predictive maintenance program.

Bently Nevada's Snapshot® eliminated the need for manual collection and reduction of vibration data. The Snapshot collects up to 3,000 overall vibration transducer signals and 92 dynamic transducer signals in one survey. This data is then processed and reduced by a computer for display.

We use the Snapshot PM software which processes overall vibration values and dynamic data. All sampled data points that exceed their specific pre-specified alarm levels and all data not sampled as planned are listed on an alarm and exception report.

For troubleshooting problem machines, we collect dynamic vibration data and reduce it in orbit, time base, and spectrum formats. The dynamic data is then plotted in a dynamic trend format, which



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extremely expensive to rebuild or replace. The program has also greatly reduced lost production from machine failure.

presents up to 52 plots of spectra versus time.

Automated data collection and reduction has enabled us to improve the effectiveness of our predictive maintenance program. We also survey machinery more often. Machines that were only checked monthly are now being checked weekly.

Since implementing our automated predictive maintenance program, approximately 550 major failures have been prevented on machinery that would have been extremely expensive to rebuild or replace. Lost production caused by machine failure has also decreased by approximately 60 percent.

Detecting a problem on a conveyor head pulley bearing before major failure saved the company millions of dollars. Production would have been stopped for about three days had the problem not been detected in the early stage of failure.

Augmenting predictive maintenance with status trending

Because the status of a machine—such as leaking oil or broken seals—is an important parameter when diagnosing a machine malfunction, we've recently added instrumentation for collecting status data

to our predictive maintenance program.

Bently Nevada's Trendmaster® acquires and trends status data on rotating machinery. The Trendmaster also collects static vibration data. It's used with a computer for automated data reduction. Status codes are entered via a keypad for automated trending. Both status codes and vibration data can be programmed for alarm conditions.

The millwrights take one of our three Trendmaster field units—along with the Snapshot—when collecting machinery data. The Trendmaster is used to collect status data on each piece of machinery in the survey. If the machine is in alarm condition, the status and vibration data is then compared.

With status and vibration information, the vibration analyst has a more complete picture of the machine's condition and can make a more informed diagnosis.

Future plans for Suncor's Predictive Maintenance Program

Because of the positive results of our predictive maintenance program, we are continually adding new machinery. We started our predictive maintenance program in 1984 with four automated vibra-

tion data collection instruments. We have since increased that number to 12. Machines not previously considered for monitoring are included in the program because periodic monitoring is now cost-effective and manageable.

The tangible result of our monitoring program has been our record-setting production during the past year because of decreasing equipment failures.

Because of the savings realized with predictive maintenance, we are in the process of installing 7200 Series Monitoring Systems on all our critical machinery. The monitoring systems, connected to a Dynamic Data Manager® computer interface and host computer, will be located in a centralized control room. The system is planned to be in place in 1987.

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Robert Betts is the Supervisor of Rotating Equipment at Suncor. He has been with Suncor for three years.

Betts graduated from Southend on the Sea College in Essex, England where he earned a City and Guilds of London Institute Certificate and an Ordinary National Certificate in Mechanical Engineering.

Betts is also a member of the Vibration Institute and the American Society of Mechanical Engineers (ASME). ■